5.1 Mission At Mubasi - A Simulation For Leadership Development

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Abstract: The United States Army is investing in simulations as a way of providing practice for leader decision making. Such simulations, grounded in lessons learned from deployment experienced leaders, place less experienced and more junior leaders in challenging situations they might soon be confronted with. And given increased demands on the Army to become more efficient, while maintaining acceptable levels of mission readiness, simulations offer a cost effective complement to live field training. So too, the design parameters of such a simulation can be made to reinforce specific behavior responses which teach leaders known theory and application of effective (and ineffective) decision making. With this in mind, the Center for Army Leadership (CAL) determined that decision-making was of critical importance. Specifically, the following aspects of decision-making were viewed as particularly important for today's Army leaders: 1) Decision dilemmas, in the form of equally appealing or equally unappealing choices, such that there is no clear "right" or "wrong" choice 2) Making decisions with incomplete or ambiguous information, and 3) Predicting and experiencing second- and third-order consequences of decisions. It is decision making in such a setting or environment that Army leaders are increasingly confronted with given the full spectrum of military operations they must be prepared for. This paper details the approach and development of this decision making simulation.

1.0 INTRODUCTION

The ambiguous, less than perfect information and limitations of human perception, match well with the contemporary operating environment which US Army leaders routinely face. For this reason the Center for Army Leadership (CAL) determined decision making in such a situation was a high priority developmental need for its leaders. Consequently, resources were dedicated to a simulation that would provide leaders with practice in this type of decision making. A first step in the simulations development was to identify appropriate decision making theories, principles and models around which the simulation would be developed. Naturalistic decision making was identified early on as a way of thinking about decision making consistent with what Army leaders actually experience. A naturalistic framework emphasizes real world decision making in demanding situations that require cognitively complex thinking skills. From among the various models that take a naturalistic approach, two in particular were important to the development of the simulation.

2.0 THEORETICAL APPROACH

Snowden and Boone's (2007) Cynefin Framework (See Figure 1), the first approach for decision-making, provided a useful way to think about the context for the simulation. The framework identifies five contexts, defined by the predominant cause and effect relationship found in each, in which a leader may find him- or herself: simple, complicated, complex, chaotic, and in-disorder. In keeping with the important aspects of decision-making we identified, our focus was on the ordered complicated and unordered complex domains. Complex contexts are characterized by the lack of a clearly right answer, unpredictability, and flux. Snowden and Boone argue that in such a context, a leader should first probe or investigate, then assess the facts, and finally respond. Such contexts often require creative or innovative decisions, which may be accompanied by a risk of failure. Consequently, inexperienced leaders or leaders who are not comfortable with the uncertainty of the situation may fall back to a more controlling style of decision-making.

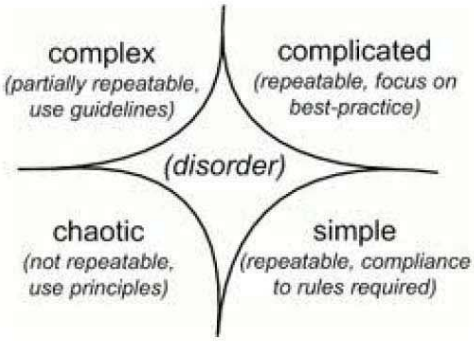

Figure 1: Cynefin Framework

The second theoretical model that provided structure to the decisions featured in the simulation was Quinn and Rohrbaugh's (1981) competing values framework. The primary tenet of the model is that organizational effectiveness is dependent on meeting numerous performance criteria that are organized by four value sets. At its core, this model is based on tensions – tensions between values and tensions between choices. In applying the competing values framework, we attempted to create tension between decision options. One source of tension was that for many of the scenarios, the decision choices were equally attractive or equally unattractive. There were numerous trade-offs among the choices, so that no single option was clearly advantageous. Another source of tension was between immediate outcomes and long-term outcomes of the decisions. For example, for a particular choice, the immediate outcomes may be very positive but the long-term outcomes are disastrous for one or more parties. Alternatively, another choice may lead to negative immediate outcomes, but the long-term outcomes are beneficial. An added advantage to using the competing values framework was that it contributed to the realism of the decisions. Often, real-life decisions are not clear-cut and trade-offs must be weighed.

Combining these two naturalistic approaches, the Mission at Mubasi simulation puts leaders in leadership dilemma situations which are initially represented as simple and ordered choices. As the simulation progresses choices become unordered and complex. The learner must gather data from multiple sources and become aware of patterns in the environment in order to evaluate a best course of action. Thereby the simulation progresses towards more ambiguity and the learner must examine problems beyond single variable possibilities.

3.0 TECHNICAL APPROACH

Figure 2: Technical Framework

Our initial objective was to create a simulation that allowed the learner to evaluate competing information and determine a best course of action. It was decided that, in order to constrain complexity, the framework would be designed to present decision dilemmas as discrete points in the simulation rather than continuous actions taken to shape the simulated environment. These discrete decision points would be multiple choice dialogue interactions where virtual avatars (one or more) would provide context to the decision.

4.0 DEVELOPING MISSION AT MUBASI

An implementation of Mission at Mubasi was created for the US Center for Army Leadership's Multi-Source Assessment and Feedback (MSAF) program called Mission at Mubasi. The context of the simulation is to enable senior NCOs and junior officers to enhance their decision-making skills by immersing them in an engaging interactive game based training environment.

Mission at Mubasi is based on a fictitious North African country that is in need of governance and infrastructure development. Within the game the learner plays a leader new to the African country situation (i.e.

taking over from a previous leader) and the environment is negative for several reasons including lack of support for the Army governance, lack of ample food and water, and minimal security. There are also multiple parties with differing, sometimes conflicting, priorities and interests that the leader must address. In the course of the simulation, the leader goes through a series of scenarios in which he or she is provided with incomplete, ambiguous information from multiple sources, and then must select an option from various courses of action, none of which were designed to be ideal responses over the others.

Game Variables: Within the game the learner's objective is to maintain four important aspects of the governance process: relationship and positive affect of the villagers, well being of his soldiers, security in the environment, and transitioning governing capacity to the local tribes. Each of these values will be modified during the simulation by decisions and actions taken by the learner.

Conditions will arise either through proactive decisions by the user, or injects (*events*) that will dynamically modify the conditions within the simulation. The Primary Variable is composed of several Micro Variables (MVs). These MVs are assigned a weight of importance by the developer, and are modified directly by the simulation in order to determine the value of the Primary Variable.

Resources: Within the simulation the learner is responsible for optimally using and maintaining several resources towards the success of the mission. These resources include food, money, political capital, medical supplies.

Win Game Scenario: If the user is properly engaged in the simulation and is generating positive results, the Primary Variables (villager relationship, soldier well-being, etc.) should all be increasing towards a *success threshold*. This threshold value for each of these variables will be built into the simulation where once all the variables have surpassed this value, the simulation is complete. The communicated reward for the leader is seeing all of the positive results in the scenario. Conversely, if all four variables fall below the minimum threshold, and remain there for a designated period of time, the leader is advised that the situation has deteriorated to the point where the scenario is unwinnable. They may restart the game and try again.

5.0 DEVELOPING SCENARIOS

Our approach to developing the scenarios was iterative and systematic, while leaving room for creativity and emotional verve. In all, 11 scenarios were developed. Initially, we developed a single, prototypical scenario to practice applying the theoretical principles discussed previously and to refine our process. Our first step was to write brief descriptions, about a paragraph in length, for each scenario. This allowed us to create an overarching storyline across all of the scenarios, bringing cohesion to the scenarios. These descriptions also served as a map for developing each of the scenarios, such that when developing an earlier scenario we could create decision options that would set up later scenarios. Within each scenario there were several details including dialogues between participants, immediate, long-term effects, multi-order decision impacts, resource modifications, and decision points for the learner. Table 1 below contains a short summation of the scenarios and competing values taking place in the simulation.

Table 1: Example scenarios and competing values

Scenario	Summary	Competing Values
Meeting with Village Elders	The overall objective is to make decisions about the initial allocation of resources. The leader is new to this assignment and this is the leader's first meeting with all the elders together. This is a critical meeting for the leader because it will set the tone for his/her relationship with the local population. In addition, because the leader is new to this assignment, subordinate Soldiers are getting to know him/her as well. Consequences of decisions in this scenario will have long-term impacts because the relationships are just forming.	• Ensuring there is adequate security and food for both villagers and refugees • Desire to make villagers happy and build a positive relationship vs. limited resources to allocate toward village • Building relationships with the leader of the refugee camp and the village
First Attack	The leader must determine the threat level against the Forward Operating Base (FOB) and decide how best to ensure its security while continuing to perform governance tasks in the village. Ultimately the leader must determine how many Soldiers to assign to security tasks and what type of security tasks they should be performing.	• Assigning Soldiers to security tasks within the safety of the FOB; • Assign some Soldiers to ambush patrols outside the FOB versus allocate Soldiers to build infrastructure for the village.
Captured Son	Your Soldiers have just gotten in from an all-night patrol and are putting away their equipment. During the patrol, there was an ambush and subsequent firefight. One of your Soldiers was shot in the back. The medic does not know if he will walk again. Your Soldiers capture one of the teenage assailants who says he was coerced by the rebels into taking part in the ambush. However, one of your Soldiers is sure that the teenager had a weapon and was firing it. As your Soldiers are putting away equipment, one of the local leaders stops by to tell you that you have mistakenly taken his son prisoner and demands his immediate release. The local leader promises you that his son will never take part in a rebel army attack on US Forces again. It is the perfect opportunity to build goodwill with a local leader and have him in your debt, yet the very idea of letting go a potential rebel Army recruit go could send the wrong message. And your Soldiers would see you as too soft on security and too keen on "building goodwill" at their expense. Do you release the son or not?	• Soldier morale vs. relationship building with the local leader • Taking a firm stance on security vs. building goodwill
Security Dilemma	The village leader is walking purposely through the village on his way to a meeting with the local police chief. The local police force is at about 50% of its strength but they were stripped of their weapons and equipment when the rebels initially swept through the area. He has requested that you re-arm his police force with weapons so that they can once again fulfill their role in maintaining law and order in the village. Yet some of the killed rebels you came across were partially clad in police uniforms and bearing police side arms.	• Security of the village vs. rebuilding local policing capacity • Increasing security vs. building a relationship with the villagers
Hiring Dilemma	The village Water & Sanitation Director was killed when the rebels initially attacked the village and a new one must be hired. The council of elders would like to be in charge of finding the new Director, but you are not sure how quickly they can do this or whether expertise and experience will be the most important criterion used for selecting a new Director. Clean water and sanitation are key to the health of the village and preventing outbreaks of disease that could threaten everyone. The council assures you that they will find someone very good, but it doesn't seem like the council has established a good process for working out disagreements (at least without outside help), and your observation has been that key positions are given out based more on relationships and tribal status than actual expertise. Consequently you are very concerned with how they will decide on someone to fill a high-level post.	• Building a positive relationship with the villagers vs. building capacity of the village.

Farmer Loyalty	You are given a situation report at the FOB that there is trouble brewing between your Soldiers and the local farmers. You decided to drive out to one of the farms, where a group of farmers has gathered to meet with you. A group of your Soldiers has been working with local farmers to try to get the farms back up and running and enhance irrigation systems in the area. While they are working with the farmers, they start realizing that the farmers are selling grain and food to the rebels. When they confronted the farmers about it, the farmers finally admit that the rebels are paying much more for the grain than they are able to get by selling supplies to the refugee camp aid workers, who you had thought were the major buyers. The farmers are also fearful of retribution if they refuse.	• Building a relationship with the villagers vs. increasing security (by not allowing the farmers to supply the rebels)
Refugee Crisis	An NGO aid worker and their coalition security force say a new wave of refugees just showed up. She says apparently there is not enough shelter, medical supplies, food and water for all the refugees who have just arrived. Some riots and fights have broken out inside the fenced perimeter of the camp. Refugees are fighting over the limited shelter space and place in line for food and water. When you get there, you can see the aid workers trying to distribute the limited food supplies with panicked looks on their faces. They have now moved their truck outside the wire, tossing food bags over the fence to the fighting mob. Technically you do not have responsibility for the refugee camp, and the villagers are opposed to giving up resources for the refugees, but the refugees could present a threat to the NGO workers and Mubasi if they start foraging for food.	• Gaining political capital with the village vs. responding to the humanitarian crisis at the refugee camp. • Gaining political capital with the village vs. intelligence gained from helping the refugees.
Sick Cattle	Cattle are getting sick at one of the biggest farms. It turns out they have been poisoned by toxic weeds leaves that have been spread around the grazing area. A significant number in the herd will need to be put down. Many are convinced that it's the Lansi tribe members in the town (sympathetic to the rebels) who are at fault. The local police chief (who is Lansi) say he will lead the investigation. Local Mutsi elder objects – saying that the Lansi police chief is biased. The Mutsi want the U.S. to lead the investigation. However, if you don't let the chief do the investigation, you will clearly be undermining his authority, and the villagers may go back to depending on you to settle disputes. Who do you put in charge of this investigation?	• Building local capabilities vs. building a relationship with the villagers
Flash Flood	A flood did major damage to the water treatment plant. It also destroyed the bridge between the farmland to the east and Mubasi, virtually cutting the route by which farmers take their crops to market, and processed foodstuffs and supplies come to Mubasi. How will you allocate your resources to ensure safe drinking water, food, without compromising security?	• Relationship with the villagers vs. security • Relationship with the villagers vs. Soldier morale
Hiring Dilemma Part 2	Sanitation has been a disaster (evidenced by trash everywhere and a growing rat population). Your senior medical personnel tell you that the village is at high risk for an infectious disease outbreak if the trash is not picked up and the rat population continues to grow. Soldiers could contract various diseases, as well. Furthermore, you just found out that many of the staff at the Sanitation Department have not yet been paid, but the money seems to have all been spent. The council is very nervous about removing the sanitation director because his family is very powerful and he is very popular. He insists that trash is not picked up and people have not been paid because his department is woefully underfunded. The council will not recommend that he be replaced. What do you do?	• Building a relationship with the villagers vs. building infrastructure • Soldier well-being vs. relationship with the villagers

Figure 3: Mission at Mubasi Environment

6.0 VIRTUAL ENVIRONMENT AND GAMEPLAY

The Mission at Mubasi Decision-Making Simulation was developed using a 3D immersive web deployable gaming engine accredited for use on the Army Knowledge Online Portal. The virtual environment contained several indoor and outdoor areas (refugee camp, downtown, water treatment plant, FOB, farm, school house, and new construction areas) and over 400 virtual avatars that provided interaction and feedback to the learner while immersed in the gaming environment. As the learner progressed through the simulation, visual and audio cues were provided to help guide the progress on each of the primary variables. For instance if villager well-being was low, villagers would sit idle in the streets and less activity would be taking place in the market.

7.0 BETA TEST

A beta test of the Mission at Mubasi Decision-Making Simulation was held at an Army classroom with 16 participants in the range of senior non commissioned officers, and junior officers. Participants were given introductory information on how to use the simulation, and were then asked to play through eleven scenarios and present objective and subjective feedback responses to the Mission at Mubasi simulation.

- *Will this lesson be useful to you on the job? If so, how? If not, why not?*
- *Were the decision dilemmas significantly challenging?*
- *Was it clear that decisions you made were tied to outcomes (1st and 2nd order effects) in the virtual world?*
- *What aspects of the simulation did you find engaging or stood out as well done?*
- *What, if anything, would you change about the simulation?*
- *Please provide any additional comments you have about the lesson.*

8.0 RESULTS

Beta test results were evaluated and categorized into two general categories, positive and negative impacts of simulation elements. Although there were many comments about the overall gameplay, Table 2 below presents the general responses we received from our two beta test groups.

Table 2: Responses from Beta-Test

Simulation Element	Positive Results	Negative Results
Understanding Competing Values (Quinn Model)	Learners felt that the dilemmas presented were generally representative of their deployment experiences.	Needed more information to determine best course of action (COA) Needed better understanding of story and mission to determine best COA.
Understanding Complexity and Decision Making (Cynefin Model)	Decisions were easily understood based on feedback within the simulation (visual cues, GUI elements) After Action Review helpful to understand impacts	At times difficult to find patterns of behavior within simulation
Engagement	Experiences engaging and sometimes fun	At times experiences were too complex to determine best approach
Developing Strategies	Interested in developing strategies	Discrete outcomes minimized strategies
Visual/Audio Cues	Fun and engaging, strong affect in certain scenes (i.e. *Attack at the Forward Operating Base*)	Issues with realism of soldier uniforms.
Understanding After Action Review (AAR)	Straight forward information provided with both graphical and text content describing the decision and impact	Sometimes hard to understand multi-order impacts over time (concept can be mentally challenging). AAR didn't go into enough detail about complicated topics.
Navigation	Simple game based interaction with engaging visuals and audio cues	For non-gamers, sometimes difficult to understand 3D navigation and game User Interfaces. No Undo feature

Competing Value Model: In terms of responding to the decision dilemmas, several participants felt that without enough information, especially in the early phases of the simulation, it was difficult to evaluate a best course of action. But the consensus was that it is unlikely a leader would always have all relevant information available to them in a real-life situation, and sometimes 'you had to do the best you could'.

Multi-Order Impacts: Our second objective was to make sure that outcomes in the environment (multi-order effects) were clearly tied to decisions or groups of decisions. This was a difficult challenge as information in the simulation was coming from multiple sources; it was therefore decided that directing the learner towards specific cues would be very important in making sure they understood relationship between cause and effect.

9.0 CONCLUSION

One of the most challenging aspects of developing a complex decision making simulation is to make a simulation real enough to simulate the variation in decision impacts, but simple enough where the learner is not lost in a myriad dynamics taking place in the game. The Mission at Mubasi simulation will continue to be evaluated over the course of the next several months for its learning efficacy. There is a great deal to understand about how decision-making can be trained including a) which are the most appropriate decision making models?, b) how important and to what level of fidelity should decisions be modeled within a simulation?, and c) what metrics are necessary to determine how well the learner was able to understand decision making impacts?

A great deal of work within the simulation was designed to challenge the user to recognize cues in the environment beyond traditional analysis of cause and effect. The emergent patterns (unordered domain) were designed to suggest to the learner that multiple decisions that were weighted towards any one of the variables could jeopardize the end result of the game. For example, if the learner were to make well-being or security, eventually this would cause events in the simulation that would decrease the overall success of the mission. Data collected from our users showed that emergent pattern recognition was most helpful when cues were ample, relevant, and consistent in the simulation. If cues were occurring in simulation that did not appear to coincide with decisions, it was more difficult for the learner to recognize the decision impact. The instructional designers used user interface cues to help clarify multi-order effects. For example, animating energy bars on the user interface helped to focus the attention of the learner on global changes in the environment, rather than direct impacts based on immediate decisions.

Future versions of the decision-making simulation will incorporate a schema format for extracting metrics for evaluation within the After Action Review (AAR) process. Additionally, it is our intention to continue to refine tools for experts to incorporate decision-making exemplars into the simulation framework.

10.0 ACKNOWLEDGMENTS

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